IN THE CLAIMS:

Please cancel claims 14-19, amend claims 1, 11, 12, and 13 and add new claims 20-26.

1. (Currently Amended) An ion implantation method for implanting ions ~~by irradiating a semiconductor substrate with an ion beam, the ion implantation method~~ comprising ~~steps of~~:

exciting a predetermined gas in a pressure-reduced chamber to generate plasma containing ions with a predetermined mass number;

forming a magnetic field along an extraction direction of the ions when the ions are extracted to the outside of the chamber; ~~and~~

extracting the ions from the chamber with a predetermined extraction energy; and

irradiating a silicon substrate with the ions, wherein the silicon substrate has an insulating layer disposed thereon.

2. (Original) An ion implantation method according to claim 1, wherein the mass number of the ions is 20 or lower.

3. (Original) An ion implantation method according to claim 1, wherein the extraction energy of the ions is 10 keV or lower.

4. (Original) An ion implantation method according to claim 1, wherein the extraction energy of the ions is 1 keV or lower.

5. (Original) An ion implantation method according to claim 1, wherein the gas is at least one selected from hydrogen gas, helium gas and boron gas.

6. (Original) An ion implantation method according to claim 1, wherein the gas is excited by arc discharge to generate the plasma.

7. (Original) An ion implantation method according to claim 1, wherein the gas is excited by a microwave to generate the plasma.

8. (Original) An ion implantation method according to claim 7, wherein the gas is hydrogen, and the hydrogen gas is excited by a microwave to generate plasma containing hydrogen molecular ions.

9. (Original) An ion implantation method according to claim 8, wherein a frequency of the microwave and intensity of the magnetic field satisfy conditions represented by one selected from the following equations:

$$\omega > \frac{eB}{2\pi m_e} \quad (3)$$

$$\omega < \frac{eB}{2\pi m_e} \quad (4)$$

where ω denotes a frequency of a microwave, m_e denotes electron mass, e denotes an electron charge, and B denotes intensity of a magnetic field.

10. (Original) An ion implantation method according to claim 8, wherein average stay time from the introduction of the hydrogen gas into the chamber until the extraction of the hydrogen molecular ions to the outside of the chamber is 5×10^{-4} to 5×10^{-3} seconds.

11. (Currently Amended) An ion implantation method according to claim 8, wherein ~~for the semiconductor substrate, a Si substrate having an insulating layer thereon is used, and~~ the Si substrate is irradiated with the hydrogen molecular ions from the insulating layer side to implant the hydrogen molecular ions at a predetermined depth of the Si substrate.

12. (Currently Amended) An ion implantation method according to claim 8, wherein ~~for the semiconductor substrate, a Si substrate having~~ the insulating layer comprises a SiO_2 layer ~~thereon is used,~~ and the Si substrate is irradiated with the

hydrogen molecular ions from the SiO_2 layer side to implant the hydrogen molecular ions at a predetermined depth of the Si substrate.

13. (Currently Amended) A ~~manufacturing~~ method of manufacturing an SOI wafer, comprising:

~~an ion implantation step of~~ forming a hydrogen ion implanted layer at a predetermined depth of a first wafer having an insulating layer on one surface of a Si substrate;

~~a lamination step of~~ laminating a second wafer ~~constituted of~~ comprising a Si substrate on the insulating layer of the first wafer after ~~the ion implantation step~~ forming a hydrogen ion implanted layer, to obtain a laminated body; and

~~a cutting step of~~ cutting the laminated body at the hydrogen ion implanted layer, wherein ~~in the ion implantation step,~~ the hydrogen ion implanted layer is formed by:

exciting a hydrogen gas with a microwave in a pressure-reduced chamber to generate plasma containing more than 50% hydrogen molecular ions;

forming a magnetic field along an extraction direction of the ions when the ions are extracted to the outside of the chamber; ~~and~~

extracting the ions from the chamber with predetermined extraction energy; and

irradiating the Si substrate with hydrogen molecular ions from the insulating layer side.

14-19. (Canceled)

20. (New) The method of claim 13, wherein a frequency of the microwave and intensity of the magnetic field satisfy conditions represented by one selected from the following equations:

$$\omega > \frac{eB}{2\pi m_e} \qquad (3)$$

$$\omega < \frac{eB}{2\pi m_e} \qquad (4)$$

where ω denotes a frequency of a microwave, m_e denotes electron mass, e denotes an electron charge, and B denotes intensity of a magnetic field.

21. (New) The method of claim 20 wherein the microwave frequency is 10% to 50% higher than the electron cyclotron frequency.

22. (New) The method of claim 21 wherein the microwave frequency is 20% to 40% higher than the electron cyclotron frequency.

23. (New) The method of claim 13 wherein the hydrogen ion implanted layer contains an ion amount equal to or greater than 1×10^{16} ions/cm^2.

24. (New) The method of claim 13 wherein the insulating layer comprises silicon dioxide.

25. (New) The method of claim 13 wherein the plasma contains more than 80% hydrogen molecular ions.

26. (New) The method of claim 24 wherein the predetermined depth is 0.005 μm to 1.5 μm from an interface between the Si substrate and the insulating layer.